



# Great Horned Owl, *Bubo virginianus* (Gmelin, 1788) (Aves, Strigiformes), in the state of Rio de Janeiro, Brazil

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## Abstract

The geographic distribution of Great Horned Owl, *Bubo virginianus* (Gmelin, 1788), in Rio de Janeiro state, south-eastern Brazil, is revised and expanded. Two individuals were recorded in an Atlantic Forest fragment surrounded by rural and industrial areas in Macaé municipality, on the northern coast of Rio de Janeiro state. This is the twentieth time that *B. virginianus* is documented in this state in the last two centuries and highlights the importance of bird surveys in regions with ornithological knowledge gaps.

## Keywords

Atlantic forest, Brazil, new record, rare bird, Strigidae

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## Introduction

The accelerated rate of biodiversity loss is one of the major problems faced by humanity (Rockström et al. 2009) due to its negative effect on the quantity and quality of ecosystem services (Cardinale et al. 2012). Cataloguing rare species is the foremost action for supporting conservation decisions, as it allows the identification of target areas for restoration and protection, mitigating the effects of biodiversity loss (Mora et al. 2011).

Brazil has one of the highest species richness on the planet, with nearly 1920 species of birds (Piacentini et al. 2015). At least 23 species of Strigiformes have been recorded in this country, which corresponds to 30.7% of all Neotropical owl species (Enríquez et al. 2006) and 9.2% of all 250 living owl species known in the world (König et al. 2008). Owls diversity is encompassed by

two families. The most diverse, Strigidae, has 26 genera and 222 species (Marks et al. 2017), including Great Horned Owl, *Bubo virginianus* (Gmelin, 1788), the only representative of the genus *Bubo* in Brazil. The second family, Tytonidae, is composed of two genera and 16 species (Bruce 2017), and is also represented in Brazil by a single species, *Tyto furcata* (Temminck, 1827).

Brazil currently has 15,719,337 ha of its territory covered by the Atlantic Forest (Ribeiro et al. 2009), which is considered a global biodiversity hotspot due to its high level of threat and exceptional numbers of rare, endemic and/or endangered species (Myers et al. 2000). The avifauna of the Atlantic Forest includes more than 200 endemic species (Bencke et al. 2006; Vale et al. 2018) and 236 nationally threatened bird species (ICMBio 2018).

Among the Brazilian states within the Atlantic Forest, the state of Rio de Janeiro has records for 799 bird species (Gagliardi 2020), and contains the largest number of endangered bird species in the Americas (Jenkins et al. 2011), even though only 18.4% of its original forest cover remains (SOS Mata Atlântica/Inpe 2010). A total of 14 owl species occur in the state of Rio de Janeiro (Motta-Junior et al. 2015; Gagliardi 2020), as well as species with unknown conservation status, such as *B. virginianus*, the largest owl in South America (Sick 2001). This species presents a wide distribution in the Americas, between latitudes 68°N and 35°S (Birdlife International 2017), and is considered relatively rare and Data Deficient in the Rio de Janeiro state (Mallet-Rodrigues and Pacheco 2015).

Therefore, our goals are to review the occurrence records of *B. virginianus*, assess its distribution in the state of Rio de Janeiro, and present a new record of this species in a coastal lowland Atlantic Forest fragment.

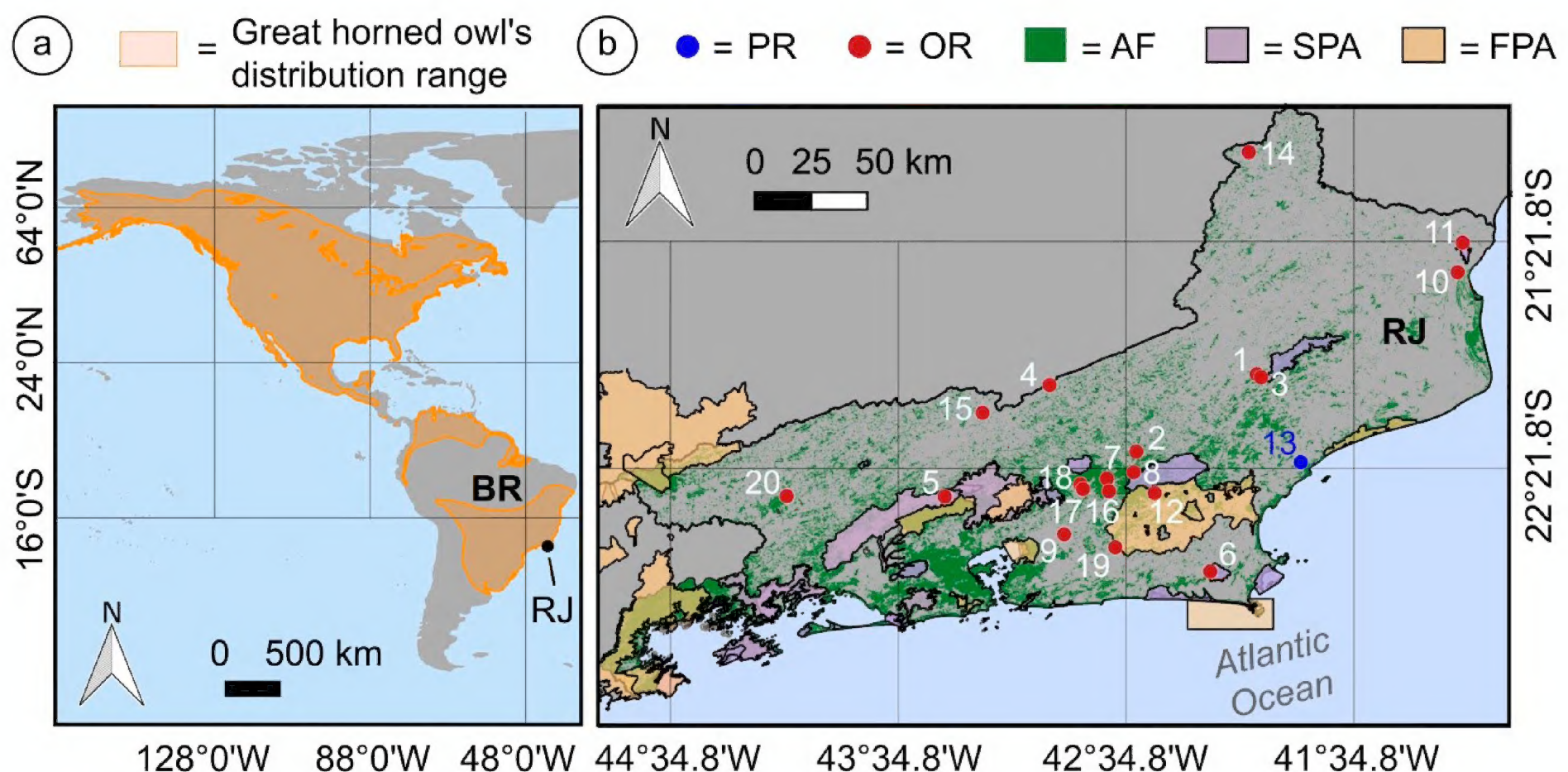
## Methods

We compiled occurrence records of *Bubo virginianus* in the state of Rio de Janeiro from Mallet-Rodrigues and Pacheco (2015), who identified 84 bird species without recent or with only scarce records during the last five decades (as the case of *B. virginianus*), and from the data paper by Hasui et al. (2018), which included occurrence and abundance data for more than 700 species in the Brazilian Atlantic Forest. Our compilation from literature was complemented by including records available in online public databases, Wikiaves (<http://www.wikiaves.com.br>) and eBird (<https://ebird.org>), which catalogue bird records from all over Brazil, and by the Petrochemical Complex of Rio de Janeiro (Comperj) bird list (Embrapa

2014). We also made field observations in a 309 ha fragment of a semi-deciduous forest. This forest fragment is part of the Santa Rita farm, about 1 km from three thermoelectric power plants and the Macaé River. The forest fragment runs along a low hilltop, has large trees with a relatively open understory, and is crossed by dirt roads. The fragment is nearly connected (with only a 100 m gap) to a 500 ha remnant (Serra do Malatesta), but more than 10 km away from the nearest 1000 ha forest patches. The nearest protected areas are the Atalaia Natural Municipal Park (16 km), the Restinga de Jurubatiba National Park (18 km), and the União Biological Reserve (20 km).

## Results

Our compilation resulted in 20 records of *Bubo virginianus* in the state of Rio de Janeiro (Fig. 1; Table 1) over the last 200 years. Seventeen (85%) of the records were made after 2000. Nine records were found in the Wikiaves database, five in the eBird database, five were published by Mallet-Rodrigues and Pacheco (2015), and one in the bird list by Embrapa (2014). There were no records in the data paper by Hasui et al. (2018). Moreover, 40% ( $n = 8$ ) of the records were in protected areas (Fig. 1; Table 1). More specifically, these were: a) record number 8, from the Três Picos State Park, b) record numbers 1 and 3, from the Desengano State Park, c) record number 6, from the Environmental Protected Area (Área de Proteção Ambiental, APA) of Serra de Sapiatiba, c) record numbers 12 and 19, from the APA of Rio São João Mico Leão Dourado, d) record number 11, from the Estação Ecológica Estadual de Guaxindiba, and e) record number 5, at Tinguá Biological Reserve (Reserva Biológica do Tinguá, REBIO) (Table 1).



**Figure 1.** *Bubo virginianus*. **A.** Distribution range. **B.** Occurrence records in the state of Rio de Janeiro. The species range is based on shape files provided by Birdlife International. The Atlantic Forest cover is based on shape files provided by the SOS Mata Atlântica foundation. Occurrence records are numbered according to record codes for additional information in Table 1. Abbreviations: PR = present record, OR = other records, AF = Atlantic Forest, SPA = State protected area, and FPA = Federal protected area.

**Table 1.** Records of Great Horned Owl, *Bubo virginianus*, in the state of Rio de Janeiro, Brazil.

Record code	Year	Locality	Geographic coordinates (WGS 84)	Source
1	1830, 1831	Muribeca (Santa Maria Magdalena)	21°57.677'S, 42°0.464'W	Wied-Neuwied 1830,1831
2	1869	Nova Friburgo	22°17.306'S, 42°32.051'W	Euler 1869
3	1986	Santa Maria Magdalena	21°57.677'S, 42°0.464'W	Mallet-Rodrigues and Pacheco 2015
4	1990	Sapucaia	21°59.722'S, 42°54.876'W	Mallet-Rodrigues and Pacheco 2015
5	2003	Tinguá (REBIO Tinguá)	22°29.547'S, 43°22.703'W	Matter 2003
6	2006	Iguaba Grande	22°49.036'S, 42°12.574'W	Carvalho 2006
7	2007	Vassouras	22°24.477'S, 43°39.777'W	Silveira 2007
8	2007	Cachoeiras de Macacu (Serra dos Tucanos)	22°22.798'S, 42°33.050'W	Bates 2007
9	2014	Itaboraí (COMPERJ)	22°39.193'S, 42°51.045'W	Embrapa 2014
10	2014	São Francisco de Itabapoana	21°28.258'S, 41°6.543'W	Marins 2014
11	2016	Guaxindiba (Estação Ecológica de Guaxindiba)	21°22.340'S, 41°5.741'W	Gagliardi 2016
12	2017, 2018	Resende	22°28.288'S, 44°27.236'W	Moraes 2017
13	2017	Macaé	22°19.132'S, 41°51.425'W	Present study
14	2017	Porciúncula	20°58.145'S, 42°2.375'W	Lyra 2017
15	2018	Três Rios	22°7.077'S, 43°12.575'W	Salgado 2018
16	2018	Cachoeiras de Macacu (REGUA)	22°27.796'S, 42°39.237'W	Tamashiro 2018
17	2018	Cachoeiras de Macacu (REGUA)	22° 26.823'S, 42°46.278'W	Dorssen 2018
18	2018	Cachoeiras de Macacu (REGUA)	22° 26.823'S, 42°46.278'W	Lane 2018
19	2018	Rio Bonito	22°42.612'S, 42°37.593'W	Falcon 2018
20	2019	Volta Redonda	22°29.245'S, 44°4.634'W	Pinto 2019

**New record.** Brazil: Rio de Janeiro state: Macaé municipality (22°19.132'S, 041°51.425'W; 40 m above sea level), FMP and PRG, 9 May 2017, a couple was observed during the morning (Fig. 2).

Owls were detected during opportunistic surveys on the edge of a lowland Atlantic Forest fragment in Santa Rita farm, near the south margin of the Macaé River during a diurnal avian faunal survey of floodplains, pastureland, and forest patches composed of native tree species, such as jequitibá (*Cariniana legalis* [Martius] Kuntze) and sapucaia (*Lecythis lanceolata* Poiret.), and exotic species, such as jackfruit trees (*Artocarpus heterophyllus* Lam.). During the fieldwork, a couple was observed about 20 m above the ground in a tree at the edge of the forest fragment. The two individuals were seen again

the next day (10 May 2017), and only one individual was located on 11 May 2017. In the following days of the survey, neither of the two individuals were seen.

In January 2018, new surveys were carried out at the locality, and individuals of *B. virginianus* were observed in another site within the same forest remnant. A couple of adults and two juveniles with well-developed plumages were found, confirming that the species is resident and uses the fragment for reproduction. Juveniles exhibited a ruddier brown-orange color, duller white throat patch and much less extensive than adults, and shorter ear tufts, and a distinct vocalization from the adult couple.

**Identification.** Individuals of *B. virginianus* were identified based on the characteristics of their plumages, with brown upperparts and dark-brown barred lower parts,



**Figure 2.** Great Horned Owl, *Bubo virginianus*. **A.** Two individuals recorded on 9 May 2017. **B.** The individual recorded on 11 May 2017 on the edge of a lowland forest fragment, municipality of Macaé, north of Rio de Janeiro state, Brazil. Photographs by Fabio de Mello Patiu.

white throat, and black facial area. *Bubo virginianus* has large ear tufts and it is the largest owl in Brazil (Ridgely et al. 2015). These characteristics distinguish *B. virginianus* from other sympatric owl species in this region, such as *Tyto furcata* (Temminck, 1827), *Glaucidium brasilianum* (Gmelin, 1788), *Athene cunicularia* (Molina, 1782), and *Pulsatrix koeniswaldiana* (W. Bertoni & M. Bertoni, 1901).

## Discussion

The new record of *Bubo virginianus* documented here for the municipality of Macaé, in northern coastal Rio de Janeiro is noteworthy as it is the twentieth record of this owl over the last 189 years of avifauna studies in the state, as revealed by our literature survey. Originally, *B. virginianus* was not included in the list of threatened species of Rio de Janeiro state (Alves et al. 2000), but later, it was included and classified as Data Deficient (Mallet-Rodrigues and Pacheco 2015), owing to the paucity of records. The species has not been recorded in several avifauna inventories conducted over the past 20 years in the state (Alves et al. 2004; Mallet-Rodrigues et al. 2008; Pacheco et al. 2010; Mallet-Rodrigues 2012; Serpa et al. 2013; Tavares et al. 2015; Tavares and Siciliano 2014). Nevertheless, owls are difficult to detect by diurnal avifauna survey methods due to their cryptic and nocturnal habits, requiring nocturnal surveys or extended searches for nests. Despite these difficulties, the new record documented here was opportunistically made during a diurnal avian fauna survey by active search, without using playbacks or nocturnal searches directed to owls.

Our new record of *B. virginianus* was made in May 2017, and the last record of the species in the state of Rio de Janeiro was in October 2019, in the municipality of Volta Redonda (Pinto 2019), more than 100 km from Macaé. Pinto (2019) documented the species in the locality by photographing an adult. Lyra (2017) also recorded the nesting of the species in the state of Rio de Janeiro, in the municipality of Porciúncula in August 2017, photographing two nestlings in a nest positioned between rocks. The reproductive cycle of the species extends approximately from December to July, with later nesting attempts after initial failures. *Bubo virginianus* lays one to three eggs, with an incubation period of 28 to 30 days, and parental care is up to five months (Holt et al. 2017). *Bubo virginianus* inhabits forest edges and secondary forest formations, usually occurring near flooded areas (Sick 2001). Studies have shown that this species has an opportunistic foraging habit, preying more frequently upon small mammals and birds, and occasionally on amphibians, reptiles, insects, and other invertebrates. It varies its diet according to the local abundance and availability of prey (Marti and Kochert 1996; Tomazzoni et al. 2004; Holt et al. 2017). These records show that *B. virginianus* has a high capacity to occupy varied types of habitats and feed on a variety of prey (Holt et al. 2017).

Our new record of *B. virginianus* for the state of Rio de Janeiro fills a gap in the occurrence of this species and adds valuable information about its habitat use. Despite the increased number of records of this species, it might still be regarded as locally rare or data deficient, as only 20 records have accumulated in nearly 200 years of ornithological studies in the state. As a quarter of rare bird species in the state have unknown causes of local rarity (Mallet-Rodrigues and Pacheco 2015), the occurrence of *B. virginianus* in this region calls attention to the importance of unprotected forest remnants to its conservation. The forest fragment where the species was recorded is isolated from larger Atlantic Forest remnants and from protected areas in a region heavily impacted by linear infrastructures (roads, gas ducts, and electric lines), and rural, urban, and industrial activities prompted by the oil exploration in Campos Ocean Basin. Therefore, protection of this and other nearby forest fragments by means of local initiatives, such as the formation of a “Reserva Particular do Patrimônio Natural” (RPPN; in English, Private Natural Heritage Reserve), is crucial for the preservation of *B. virginianus* and other rare species. We suggest that continuous monitoring of the avian fauna in Rio de Janeiro state is required to provide detailed geographic and abundance information on rare species, such as *B. virginianus*.

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## Authors' Contributions

FMP and PRG made observations in the field. FMP photographed and identified the specimens. FMP, DCT, and PRG wrote the text. DCT produced the map.

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